

From: [Rhotenberry, William](#)
To: [Ruhl, Christopher](#); [Brescia, Nicolas](#); [McAteer, Mike](#); [Mason, Steve](#)
Subject: Fw: Results of Oil Fingerprint Comparison
Date: Monday, April 22, 2013 4:24:16 PM

Not sure I know any more than I did. Let me know what you guys think. I also think we need to decide our method to share data. Thanks.

From: Rhotenberry, William
Sent: Monday, April 22, 2013 4:14:11 PM
To: Powell, Greg
Cc: Humphrey, Alan
Subject: Re: Results of Oil Fingerprint Comparison

Thanks a lot for all the help Greg. Alan I may follow up with you on this.

From: Powell, Greg
Sent: Monday, April 22, 2013 3:24:15 PM
To: Rhotenberry, William
Cc: Humphrey, Alan
Subject: FW: Results of Oil Fingerprint Comparison

Bill:

Hi Bill:

The Mayflower sample was compared to the Enbridge Line 6B oil (see below). I not sure the data comparison is conclusive either way. I suggest you get up with Alan Humphrey. He is the ERT WAM for the oil work, and maybe you guys could discuss further.
thanks

From: Humphrey, Alan
Sent: Monday, April 22, 2013 9:22 AM
To: Powell, Greg
Cc: Burchette, Sella; Sprenger, Mark
Subject: Results of Oil Fingerprint Comparison

Greg, here is the SERAS summary. Given the limitations of the information, the possible presence of a crude oil mixture, and the fact that the only tar sands oil we have in our inventory is Alberta, the conclusion is not a definitive yes or no. John compared the COIL sample to the most similar sample from Michigan. A hard copy comparison of GC/MS scans is also not as fruitful as using electronic files. The COIL sample is not an identical Match compared to Alberta tar sands crude, "However, the oil spilled at Enbridge Oil contained a mixture of "tar sands bitumen" with "fresh crude oil", which resulted in an overall fingerprint that was "similar" to the fingerprint of the COIL sample. " If desired, a more thorough review can be conducted, including analysis of original oil samples which may comprise the mixture.

From: Syslo, John E [<mailto:john.e.syslo@lmco.com>]
Sent: Friday, April 19, 2013 5:25 PM
To: Humphrey, Alan; deborah.a.killeen@lmco.com; dennis.a.miller@lmco.com; thomas.miller@lmco.com
Cc: john.e.syslo@lmco.com; vinod.c.kansal@lmco.com

Subject: Results of fingerprint evaluation.

Alan, I'm not sure if you need an "official" memo report for the Mayflower Oil Data, but as we discussed, I can spend more time and include additional details & chromatograms if requested.

Alan had asked me to examine the COIL data and try to determine whether the sample may contain "tar sands" oil, but *not necessarily* the Alberta "tar sands" oil which was spilled into the Kalamazoo River. I selected sample SERAS-017-0005 as the best representative "tar sands" oil to compare to the fingerprints of COIL sample 13-119-2.

I compared the COIL GC/MS and GC/FID fingerprints to the SERAS GC/MS fingerprints of sample SERAS-017-0005 from the Enbridge Oil project. The evaluation that I am providing should be considered as a qualitative estimation since I'm comparing hardcopy GC/MS fingerprint chromatograms/data from the COIL lab to the SERAS GC/MS fingerprints of a sample that was selected as the "best match" to the COIL sample.

After comparing the GC/MS fingerprints of the COIL data to the SERAS data these are the results of the evaluation:

- SERAS sample 017-0005 exhibited a GC/MS "linear scan" total ion chromatogram fingerprint that was very similar to the COIL GC/FID fingerprint of sample 13-119-2. The similarity was observed in the distribution of n-alkanes across the entire fingerprint, which indicates that there was little biodegradation to sample 13-119-2.
- The biomarker hopane and steranes fingerprints indicate that the COIL sample does NOT MATCH the Alberta Tar Sands oil.
- The GC/MS TIC fingerprints indicate that the COIL sample contains an overall higher concentration of PAH compounds in the oil relative to the SERAS sample.

Overall Conclusion: Oil defined as "tar sands oil" or "tar sands crude" usually exhibits a characteristic fingerprint that resembles a late eluting "hump" and does not contain discernible n-saturated hydrocarbons. If I compare the COIL sample to an actual sample of Alberta tar sands bitumen, the results would be "no match". However, the oil spilled at Enbridge Oil contained a mixture of "tar sands bitumen" with "fresh crude oil", which resulted in an overall fingerprint that was "similar" to the fingerprint of the COIL sample.

Based upon the comparison of the COIL sample to a known mixture that consists of a "tar sands crude" with "crude oil", it is difficult to determine whether the COIL sample is a mixture of "crude oil with tar sands bitumen", but this doesn't rule out that the possibility exists.

Sample 13-119-2 may be a mixture of a "tar sands" type of crude oil with a fresh crude oil of another, or similar origin. This can not be determined without having the analysis data from the products that make up the mixture.

However, sample 13-119-2 may also be a "signature" tar sands oil that the SERAS lab is not familiar with at this point. The sample is NOT derived from or related to the fresh crude or tar sands

bitumen that originates from the Alberta oil fields in Canada.